

Overview of Thailand case study for higher blend of biodiesel

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The 1st APEC Workshop on Guidelines toward High Biodiesel Blend Diesel
(eg B20) Specification in the APEC Region

13-14 December 2017

CC405, Thailand Science Park, Thailand

Outline

- Update on current national project (2016-2018)
“Implementation of Higher Blend of Biodiesel”
funded by ENergy CONservation (ENCON) fund
via Department of Alternative Energy Development
and Efficiency (DEDE)



(2012-2021)



(2015-2036)

As approved by National Energy
Policy Council (Sep.17, 2015)

Overall Targets



By
2021

Renewable Energy
in total energy consumption



By
2036

Renewable Energy
in total energy consumption



Electricity

13,927 MW

19,684.4 MW

(20.11% of Electricity Demand)



Heat

9,800 ktoe

25,088 ktoe

(36.67% of Heat Demand)



Fuel

9 MLPD Ethanol
7.2 MLPD B100

+ 3 MLPD Advanced Biofuel

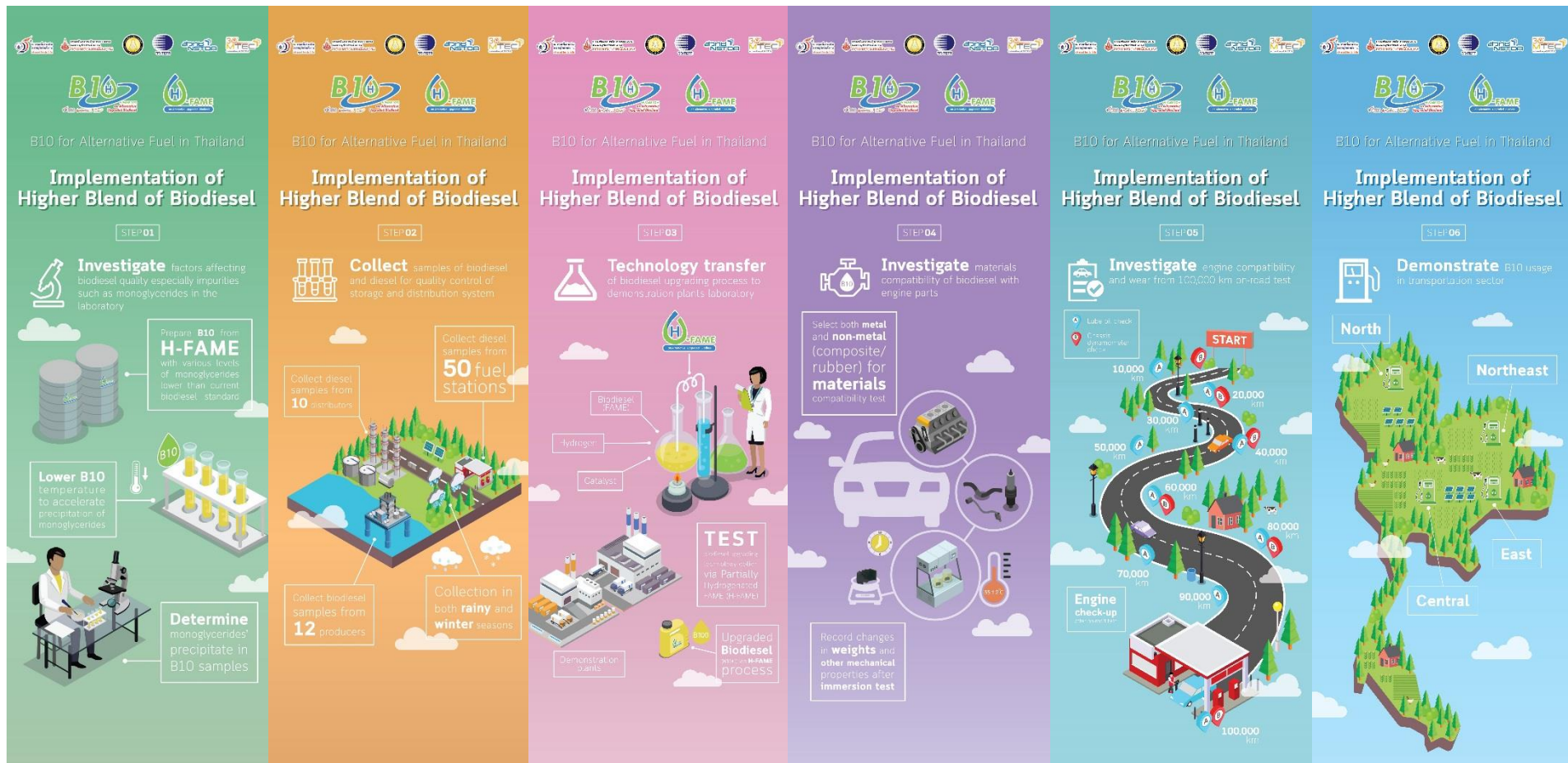
11.3 MLPD Ethanol
14 MLPD B100

+4,800 TPD of CBG

(25.04% of Fuel Demand)

Biodiesel upgrading: H-FAME

Testing of B10 from H-FAME



1. %MG from precipitation test

2. Fuel quality survey

3. TT of H-FAME to local BDF producers

4. Materials compatibility with B10

5. 100,000km on-road test with B10/H-FAME

6. Large-scale demonstration with B10/H-FAME



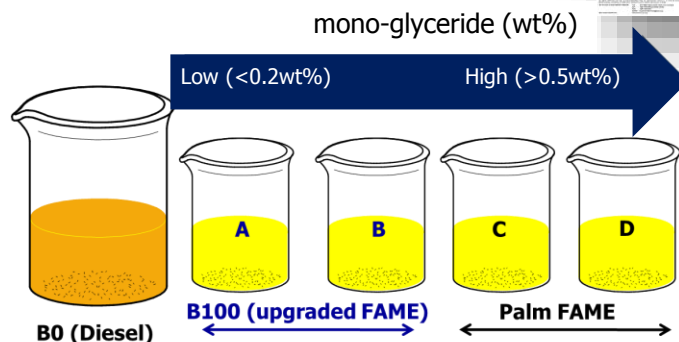
Project plan to obtain Thailand's data



Procedure



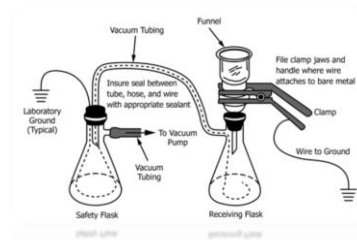
Test following JAMA
ASTM D7501-12a
ASTM D4625-14



Prepare biodiesel with different amount of
mono-glyceride (%MG)



Place samples at temperatures of 5, 10, 15 and 25
°C with 2 weeks duration (5 times sampling)



Filter the samples by fiber filtration paper of 0.8
micron pore size under the vacuum (75-80 kPa), and
weigh precipitates on filter paper (if any)



Place the samples at room temperatures and in water
baths at 25 °C for 4 hrs (if some solid phase) or 2 hrs
(if liquid phase)

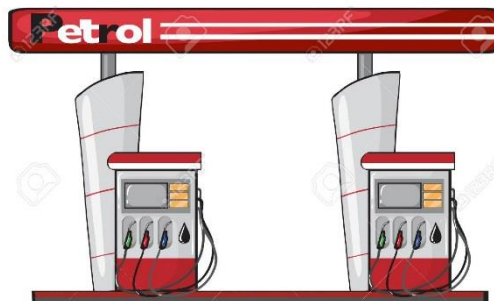


Oil Sampling Plan



10 Oil Depots

Diesel blend (Bxx) or/and
Biodiesel (B100) or/and
Base diesel (B0)



50 Petrol Stations

Diesel blend (Bxx)



12 Authorized Biodiesel Producers

Biodiesel (B0)

Sampling Periods

- Rainy season (June-July 2017)
- Winter (November-December 2017)

The total samples

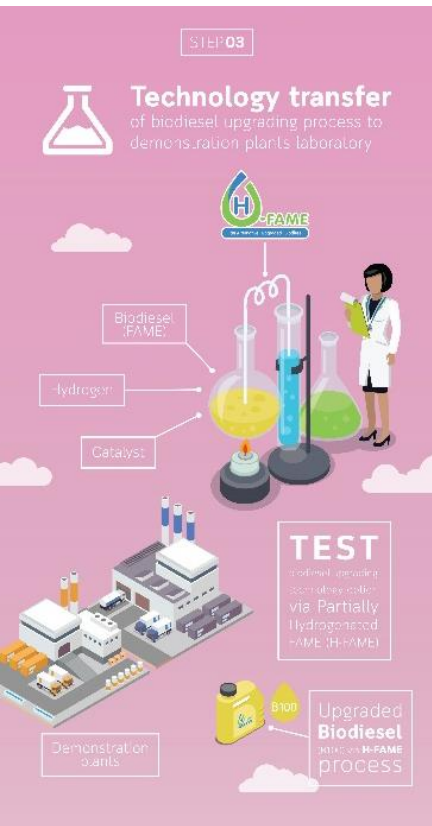
- 1. 120 diesel samples
- 2. 24 biodiesel samples

The properties to be tested

Diesel (10 distributors) (50 gas stations)		Biodiesel (12 manufacturers)	
Property	Value	Property	Value
Water content (EN ISO 12937)	≤ 300 mg/kg	Water content (EN ISO 12937)	≤ 500 mg/kg
Oxidation stability (EN 15751)	≥ 35 hr	Oxidation stability (EN 15751)	≥ 10 hr
fatty acid methyl ester (EN 14078)	$\leq 7\%$ vol. and not less than the specification by Department of Energy Business*	Acidity (ASTM D664)	≤ 0.50 mg KOH/g
		Mono-glyceride (EN 14105)	≤ 0.70 by weight
		Cloud point (ASTM D2500)	Not specified in notice of the Department of Energy Business
Sample's volume of 5 L/time		Sample's volume of 5 L/time	

*Notation: abide by notice of the Department of Energy Business

Technology transfer of biodiesel upgrading process to the demonstration plants



Select two biodiesel manufacturers that are ready and willing to receive technology transfer on biodiesel-upgrading technology

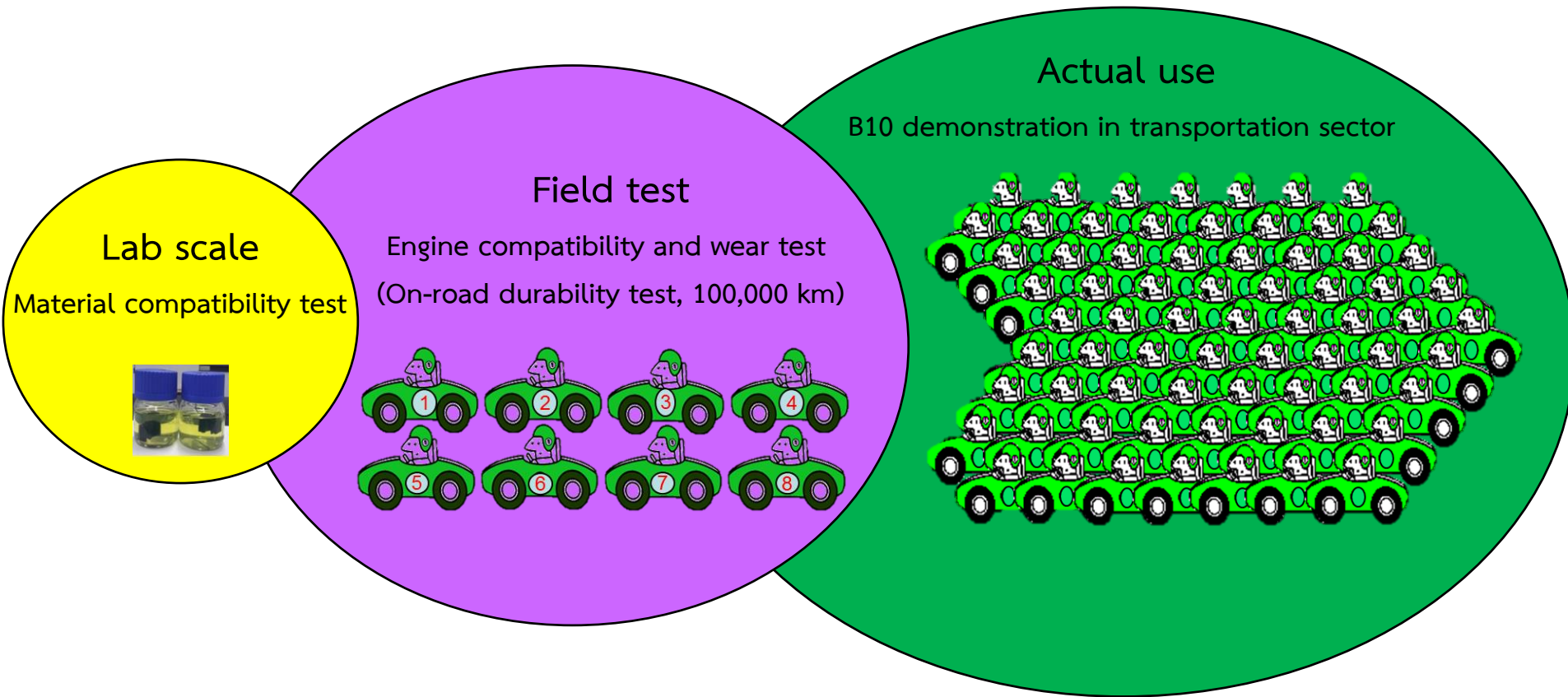
Install and produce upgraded biodiesel from the technology-transfer process

Test the system and operate biodiesel upgrading process

Check upgraded biodiesel quality to meet low MG content

Produce high quality biodiesel to support on-road test by light-duty vehicle and demonstration of B10

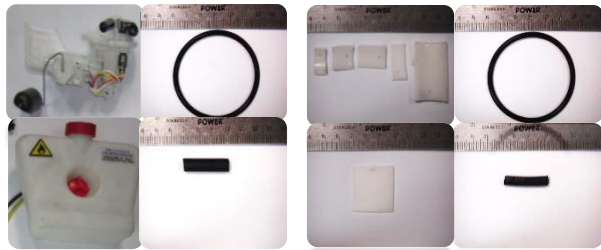
Plan for B10 testing (using upgraded BDF)



Immersion test consists of metal and non-metal parts



Testing standards of SAE J1748, J1748
and ASTM D417



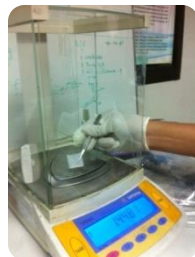
Preparing the specimens



Weighing and packing the specimens



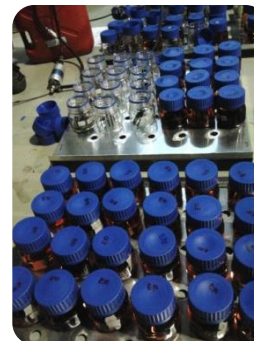
All specimens



Weighting after
immersion



Weighting (initial)



$55 \pm 2^\circ\text{C}$

$45 \pm 2^\circ\text{C}$



Replacing
the test fuels

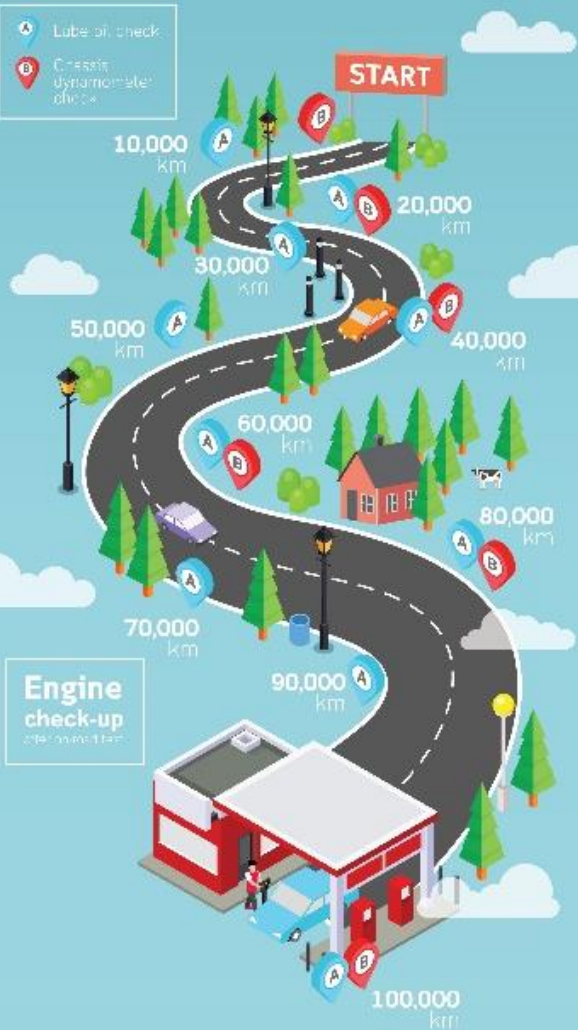
Engine compatibility and wear test

STEP 05



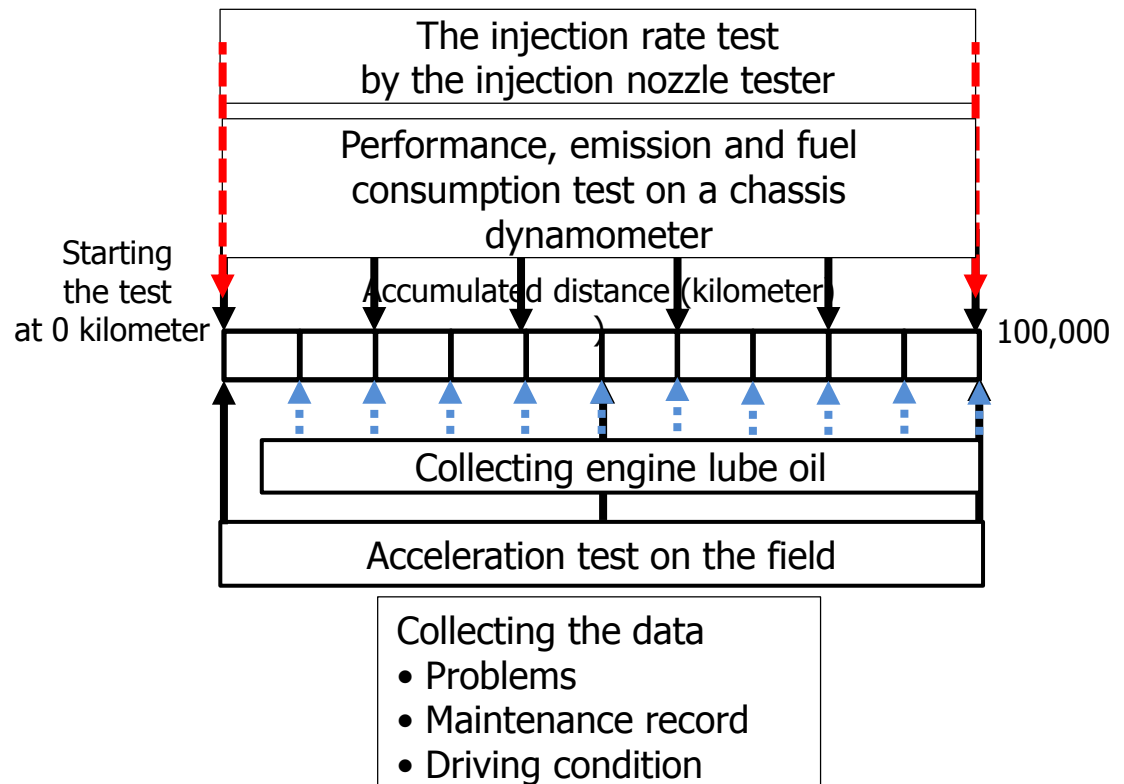
Investigate engine compatibility
and wear from 100,000 km on-road test

- A Lube oil check
- B Chassis dynamometer check



Selecting vehicles

Inspecting and preparing the vehicles



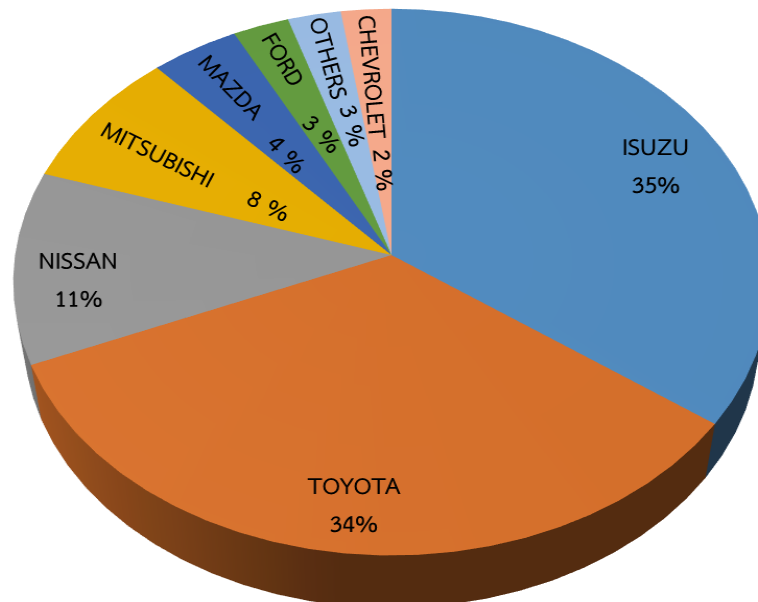
Evaluating and inspecting the vehicles



Vehicle selection

All brands for pick up truck registered in Thailand

1. CHEVROLET	2. CITROEN	3. DAIHATSU	4. DATSUN	5. DEVA
6. DFM	7. DFSK	8. DODGE	9. FARGO	10. FORD
11. HINO	12. HONDA	13. HYUNDAI	14. INTERNATIONAL	15. ISUZU
16. JEEP	17. KIA	18. KIA MASTER	19. LAND ROVER	20. MAZDA
21. MITSUBISHI	22. NISSAN	23. OPEL	24. PEUGEOT	25. SUBARU
26. SUZUKI	27. TATA	28. TOYOTA	29. TRIUMPH	30. V.M.C
31. VOLKSWAGEN	32. WILLYS	33. WULING		



Choosing from
market share

ISUZU
TOYOTA

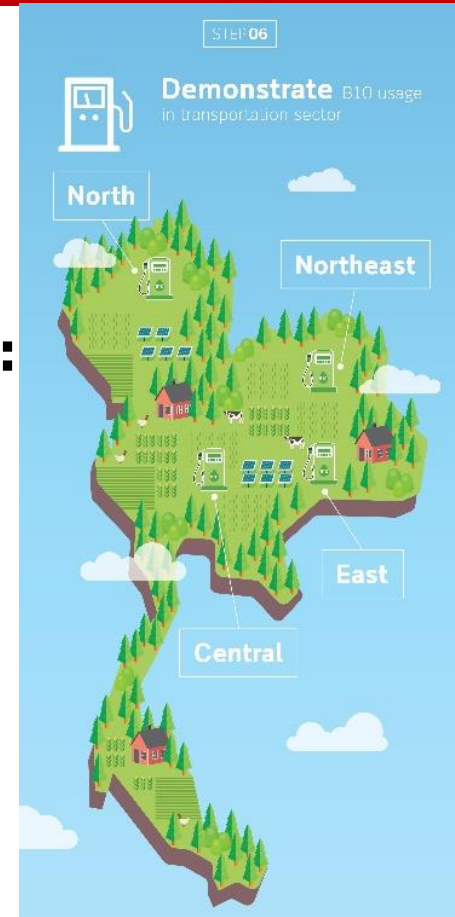
B10 demonstration in transportation sector

Fuel : B10 from 10% of H-FAME blended

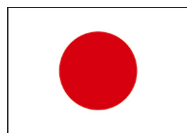
Volume : 120,000 L

Organization interested to participate in this project:

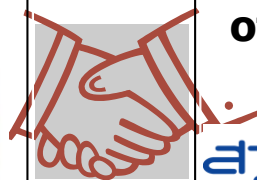
- **Kasetsart University**
- **Rajamangala University of Technology Thanyaburi**
- **Royal Thai Navy**
- **NSTDA**



Acknowledgements



Japan



Kingdom
of Thailand



Deeply appreciate

SATREPS

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- all of the research participants of **NSTDA/MTEC, TISTR, KMUTNB, WASEDA U. and AIST** for their contributions to this Project.
- **ISUZU** Thailand group for their kind supports on the on-road tests, and **PTT, Bangchak and Thai oil** for supplying the FAME (B100) and petro diesel (B0) and for measuring the fuel quality.
- Department of Alternative Energy Development and Efficiency (**DEDE**) to conduct national project on H-FAME evaluation under patronage of ENergy CONservation (**ENCON**) fund

Thank you for your kind attention

